Appendix I

Supplemental Information On Alternative Location West Cameron Block 183

1. Introduction

An alternative location for the Gulf Landing LNG terminal is in Block 183 in the West Cameron Area (WC 183) in the Gulf of Mexico (GoM) Offshore Louisiana. This location is approximately 30 miles (48 kilometers [km]) offshore and is near an existing shipping fairway serving the Calcasieu River and area ports.

The terminal design for this location is assumed to be unchanged from that described in the Gulf Landing Deepwater Port permit application dated October 30th 2003. At the alternative location, the terminal would be capable of storing up to 180,000 cubic meters (m^3) net of LNG and vaporizing up to 1.2 billion cubic feet per day (Bcfd). Up to five (5) takeaway pipelines would interconnect with existing natural gas pipelines located in the GoM. From these pipelines, the natural gas would enter the onshore national pipeline grid.

2. Location and Use of Deepwater Port

The alternative location of the terminal is shown on Figure 1. The general layout of the terminal alternative location is shown on Figure 2. The terminal consists of two concrete GBSs with integral LNG storage tanks, LNG carrier berthing provisions, LNG unloading arms, high-pressure pumps, vaporizers, sales gas heaters, fiscal meters, utility systems, general facilities and accommodations. The terminal will be designed to handle a nominal capacity of 7.7 million tonnes per year of LNG. This equates to a nominal vaporization capacity of 1 Bcfd. The vaporization facilities will be designed for a peak capacity of 1.2 Bcfd to provide additional supply during periods of peak demand.

The terminal would provide the same seven basic functions at the alternative location:

- LNG carrier berthing;
- LNG carrier unloading;
- LNG storage;
- LNG vaporization;
- Gas metering and delivery;
- Power generation; and
- Personnel quarters.

LNG carriers will need to traverse the western portion of West Cameron Block 181 (WC 181) and West Cameron Block 182 (WC182) for ingress to and egress from the terminal. The arrangement of the berthing area, mooring locations, new send-out pipelines, and LNG carrier traffic pattern is shown on Drawing Numbers 03-003-1075 and 03-003-1076.

3. Marine Pipelines

The alternative location would have up to five new takeaway pipelines, totaling approximately 51.1 miles (81.8 km), constructed to connect the terminal to the existing offshore pipeline infrastructure. The pipeline lengths and routes are different for the alternative location. The pipelines would be located in water depths varying from approximately 42 to 56 ft (13 to 17 m)

and would be buried to meet the regulatory standards of an equivalent 36 inches (0.91 m) of cover except that pipelines crossing shipping fairways will be buried with 10 ft (3 m) of cover. The pipelines would be installed using a shallow-draft lay barge and trenched by a barge equipped with a trenching spread thereafter. As the pipeline lengths for the alternative location are shorter, some further optimization in pipeline diameter would be possible, this has not been considered at this time. Drawing No. 03-003-1074 shows the alternative pipeline routes.

- Pipeline 'A' would have a capacity of 800 MMscfd (22.7 MMscmd) operating at 1,218 pounds per square inch gauge (psig; 84 barg) with an outside diameter of 36 inches (0.91 mm). Pipeline 'A" would be approximately 19.3 miles (30.9 km) in length.
- Pipeline 'B' would have a capacity of 500 MMscfd (14.2 MMscmd) operating at 1,145 psig (79 barg) with an outside diameter of 24 inches (0.61 m). Pipeline 'B" would be approximately 4.6 miles (7.4 km) in length.
- Pipeline 'C' would have a capacity of 500 MMscfd (14.2 MMscmd) operating at 1,203 psig (83 barg) with an outside diameter of 30 inches (0.76 m). Pipeline 'C" would be approximately 10.7 miles (17.1 km) in length.
- Pipeline 'D' would have a capacity of 500 MMscfd (14.2 MMscmd) operating at 1,218 psig (84 barg) with an outside diameter of 16 inches (0.41 m). Pipeline 'E" would be approximately 1.3 miles (2.1 km) in length.
- Pipeline 'E' would have a capacity of 300 MMscfd (8.5 MMscmd) operating at 1,160 psig (80 barg) with an outside diameter of 20 inches (0.51 m). Pipeline 'E" would be approximately 15.2 miles (24.3 km) in length.

The following table summarizes mileages, volumes of hydrostatic water, and sediment disturbance associated with the installation of the pipelines.

Pipeline	Mileage of Pipe Required	Pipe Diameter (in.)	Total Volume (ft3)	Total Volume (Gallons)	Acreage of Disturbed Sediments (Acres)
A	19.3	36	679,452	5,082,302	467
B	4.6	24	69,432	519,354	111
C	10.7	30	259,981	1,944,657	260
D	1.3	16	8,290	62,006	31
E	15.2	20	158,356	1,184,499	369

4. *Charted Water Depth*

Bathymetric data from the National Geophysical Data Center (NGDC) Geophysical Data System (GEODAS) Hydrographic survey database is presented in Drawing 03-003-1250. Water depths within OCS Block 183 range from 46 feet (ft; 14.0 meters [m]) at the northern boundary of the block to 56 feet (ft; 17.1 meters [m]) at the southern boundary of the block. The seafloor slopes

toward the south with an average seafloor gradient of 0.04°. The alternative terminal site would be situated in the southeast corner of the block in a water depth of 54 feet (ft; 16.5 meters [m]).

5. *Soil Data*

No site-specific surveys have been performed at the alternative Gulf Landing LNG terminal site in OCS Block 183. A bathymetric and geophysical survey of adjacent OCS Block 182 was performed in 1990 (Gulf Ocean Services, Inc. 1990). Bathymetric and geophysical data were also acquired in adjacent OCS Block 182 during the survey of the five proposed Gulf Landing pipeline routes (Fugro Geoservices, Inc. 2003). A geotechnical investigation in adjacent OCS Block 170 was performed in 1979 (Fugro Gulf, Inc. 1979). The above referenced survey information from OCS blocks adjacent to OCS Block 183, together with public domain information on the regional and local geology, comprises the available data for assessment of soil conditions at the alternative terminal site.

Existing infrastructure in OCS Block 183 comprises one 36-inch diameter gas pipeline, which crosses the western part of the block in a north-south direction.

The near-surface geology of the West Cameron area has been influenced by fluctuating sea levels associated with climatic variations. Sea level stands in the late and early Wisconsin have exposed the shelf area and subjected the soils to subaerial weathering and erosion processes (Fugro-McClelland Marine Geosciences, 2003a). Unconformities and buried channels are therefore common features on high-resolution seismic profiles collected in the vicinity of the alternative terminal site.

Geotechnical data acquired in adjacent OCS Block 170 comprises a single borehole to 300 feet (ft; 91.4 meters [m]) below the seafloor. The stratigraphy at the borehole location comprises a loose sand layer, 8 feet (ft; 2.4 meter [m]) thick, at the seafloor, which is underlain by a sequence of stiff to hard overconsolidated clays and medium dense to very dense sand layers to a depth of 300 feet (ft; 91.4 meters [m]) below the seafloor.

Available information suggests that the foundation soils at the alternative terminal site have been influenced by the same geological processes as the foundation soils at the preferred terminal site. The closest available stratigraphic information, from adjacent OCS Block 170, is also similar to that identified at the preferred terminal site.

Soil Suitability

The major marine components associated with the terminal are two Gravity Base Structures (GBS). Once installed, each GBS will be subject to dead loads (e.g. weight of structure), live loads (e.g. weight of the LNG in the storage tanks) and environmental loads (e.g. wind, wave and current). Shallow skirt foundations were selected as the base case foundation for the GBS. No site specific stratigraphic information is available for OCS Block 183, however regional geologic information (Berryhill et al. 1986), geophysical data from adjacent OCS Block 182 and stratigraphic information from adjacent OCS Block 170, suggest that the foundation soils in OCS Block 183 comprise approximately 0 to 8 feet (ft; 0.0 to 2.4 meter [m]) of granular sediments overlying overconsolidated sediments. No design analyses have been performed to size the skirt foundations for the alternative terminal site. However, the similarity in the inferred soil

conditions, between the preferred and alternative terminal sites, suggests that skirt foundations can be designed to provide the major marine components with an appropriate level of safety against failure of the soil under the design loads.

Seabed Stability

Available data suggest that the surficial soils at the alternative terminal site are granular sediments. It is therefore likely that the surficial soils would be unstable during severe storms, as was found at the preferred terminal site in OCS Block 213 (Fugro-McClelland Marine Geosciences, 2003b). The proposed skirt foundations will confine the seabed, within the footprint of the GBS, and scour of the surficial sediments adjacent to the GBS will be mitigated by the placement of rock gabiens as detailed in the Basic Design Package (Shell Global Solutions, 2003).

The alternative terminal site is approximately 30 miles (49 kilometers [km]) from the Louisiana coast. Operation of the terminal in OCS Block 183 is therefore expected to have a negligible impact on the accretion or erosion of the coastline closest to the marine site.

References

Berryhill, H.L., Jr., Suter, J.R., and Hardin, N.S., (1986), "Late Quaternary Facies and Structure, Northern Gulf of Mexico," AAPG Studies in Geology #23, American Association of Petroleum Geologists, Tulsa, Oklahoma.

Fugro Geoservices (2003), "Archeological, Engineering and Hazard Survey of Five Proposed Pipeline Routes within West Cameron Area, Gulf of Mexico," Report to SIEP, Houston, October.

Fugro Gulf (1979), "Soil and Foundation Investigation, Boring D-18, Block 170, West Cameron Area, Gulf of Mexico," Report to Shell Oil Company, Houston, December.

Fugro-McClelland Marine Geosciences (2003a), "Potential Sediment Stratigraphy and Foundation Conditions, Block 213, West Cameron Area," Report to SIEP, Houston, March.

Gulf Ocean Services (1990), A high resolution geophysical survey report for Gulf of Mexico – offshore Lousiana, West Cameron Area, Block 182, OCS-G-10552, report to Unocal Exploration Company.

Shell Global Solutions (2003), "Gulf Landing LNG Import, Basic Design Package," Houston, October.

Fugro-McClelland Marine Geosciences (2003b), "Geochronology of Seafloor Sediments, Gulf Landing - Phase 1 Site Investigation, Block 213, West Cameron Area, Gulf of Mexico," Report to SIEP, Houston, October.

6 *Key Differences Between Locations*

This sections discusses key differences between the proposed location at WC 213 and the alternative location at WC 183

Safety

There is an unimpeded access to location from ship channel for the preferred location. This results in a lower potential for LNG Carrier collision with adjacent block jackets, than for the alternative location, which would result in the LNG Carriers negotiating a course to avoid structures in route from the fairway to the facility. This is considered to be a significant difference between the two alternatives as marine safety and access will be key issues during the operational phase of the project.

The water depth at the preferred alternative is closer to the optimum water depth and provides less potential for a grounding event by the LNG Carrier in areas around the installation. (This however, remains a low risk in both locations but is potentially worse in the alternative location.)

Environment

There are no differences in the air discharges from the installation associated with the alternative location, however the location is closer to shore the levels of air pollutants impacting the shore line would be lower for the preferred alternative.

There are no differences to water discharges or marine life entrainment and impingement impacts associated with the alternative location. In both alternatives the same amount of seawater warming water would be required, and there is no discernable differences in marine life in the water column or cold-water dispersion calculations.

Pipelines for the alternative location would be shorter for the alternative location. This will result in less potential damage to marine life during the pipeline construction activities. However, the damage to marine life associated with pipeline construction is generally considered to be small, and the ecosystem will recover from this temporary effect, as demonstrated across the GOM. It should also be noted that the number of pipelines actually required for the installation has not been established. Up to 5 pipelines are proposed, the final selection of the number of pipelines required will be the result of commercial negotiations, which will be impacted by the actual free capacity of each potential pipeline closer to date of operations.

The depth at the alternative location may be marginal for installation and operation of the facility. This may result in a requirement for some dredging of the alternative location to ensure sufficient depth for LNG Carriers. This is not considered to be a likely requirement at either location, but is considered to be more likely at the alternative location than the preferred location.

Commercial

The alternative block is currently leased. Negotiations for surface rights have the potential to result in a less than optimal location from a marine safety perspective. They also have the potential to result in delays or significant additional costs. While the preferred alternative is not presently leased, and there have been no recognized interest in mineral rights for the location. It is considered likely that there is little interest is exploring for hydrocarbons on the preferred location in the future, which should allow for safe and unhindered access to the facility by LNG Carriers.

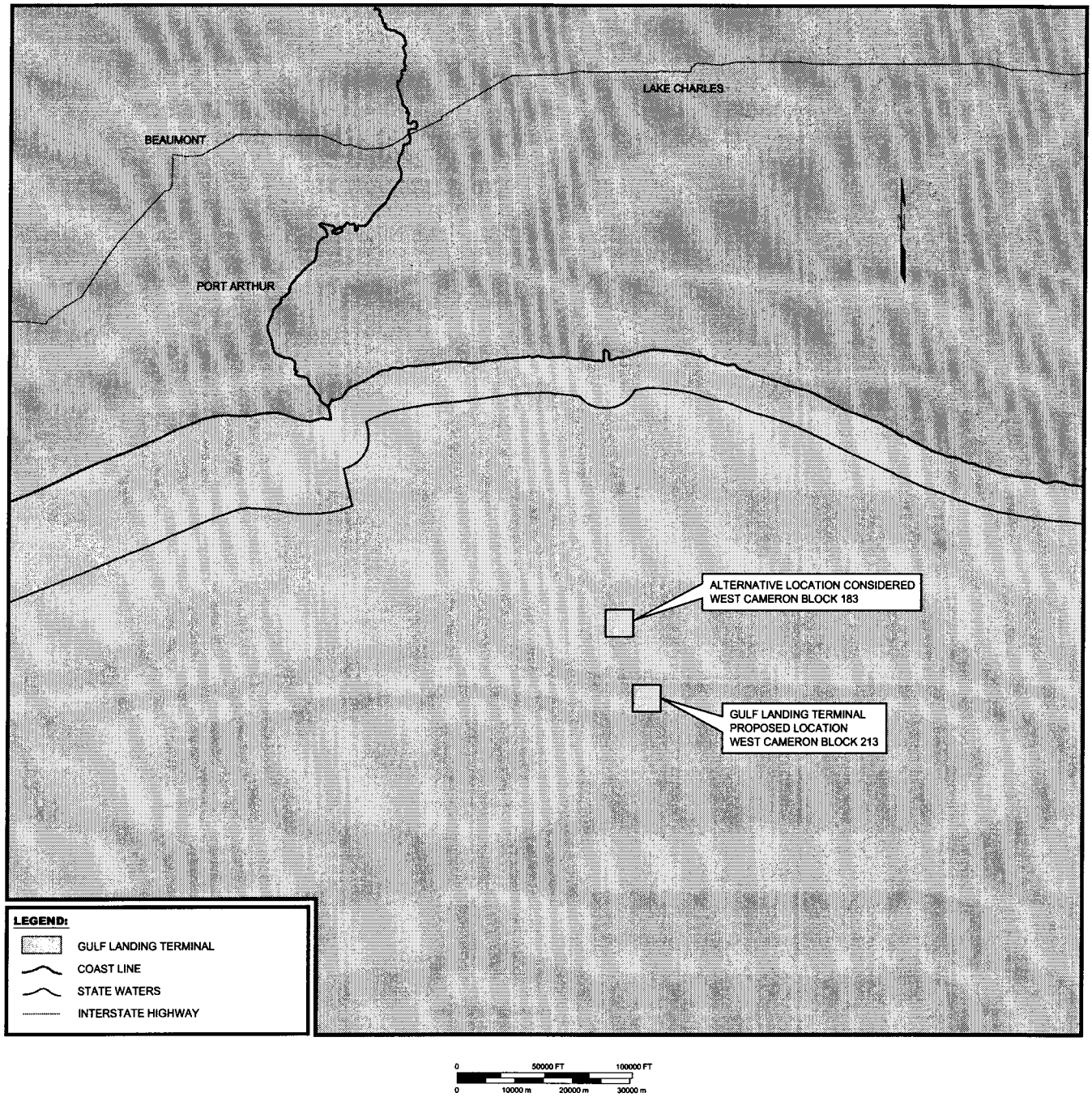


Figure 1
Site Map for Gulf Landing Terminal

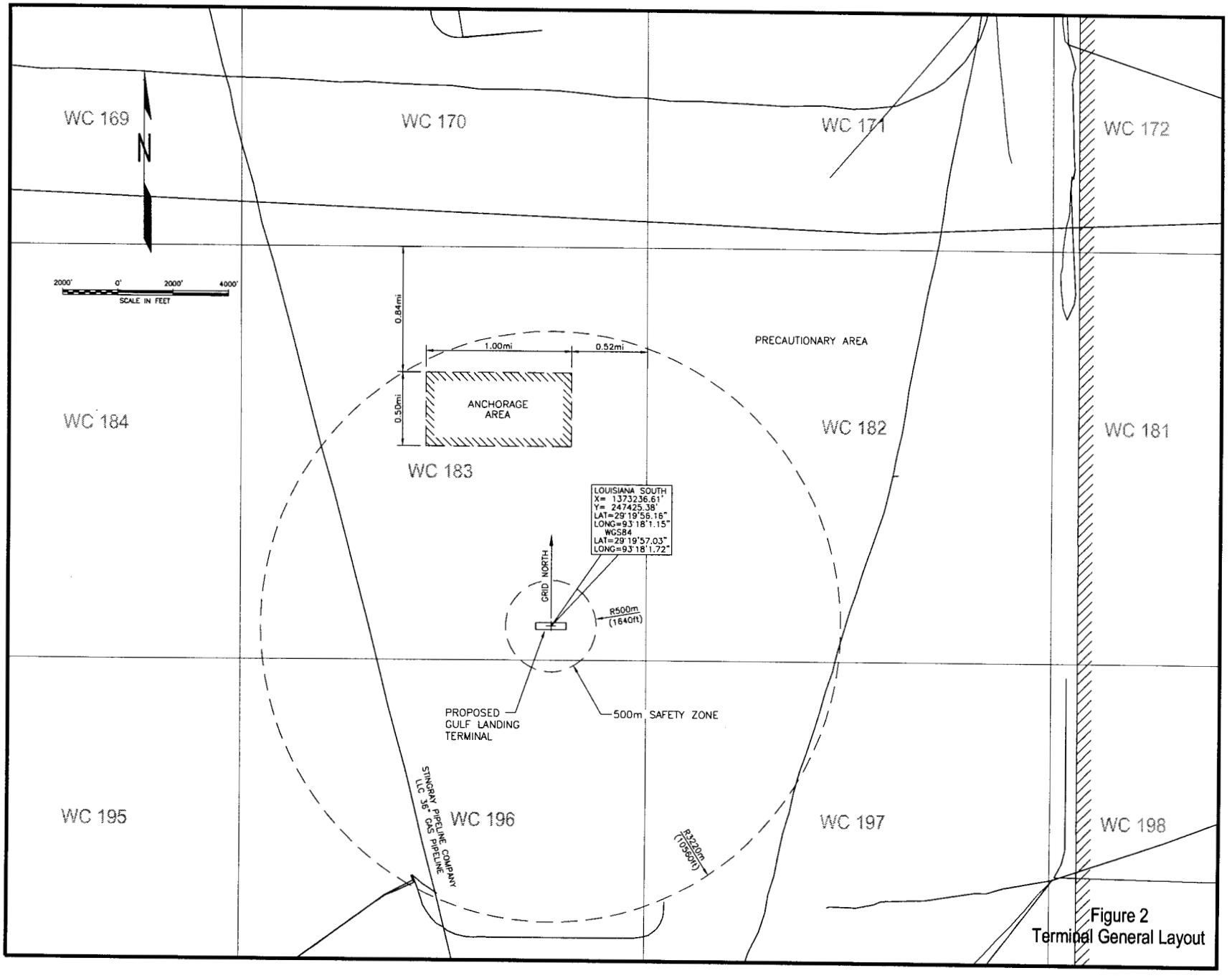
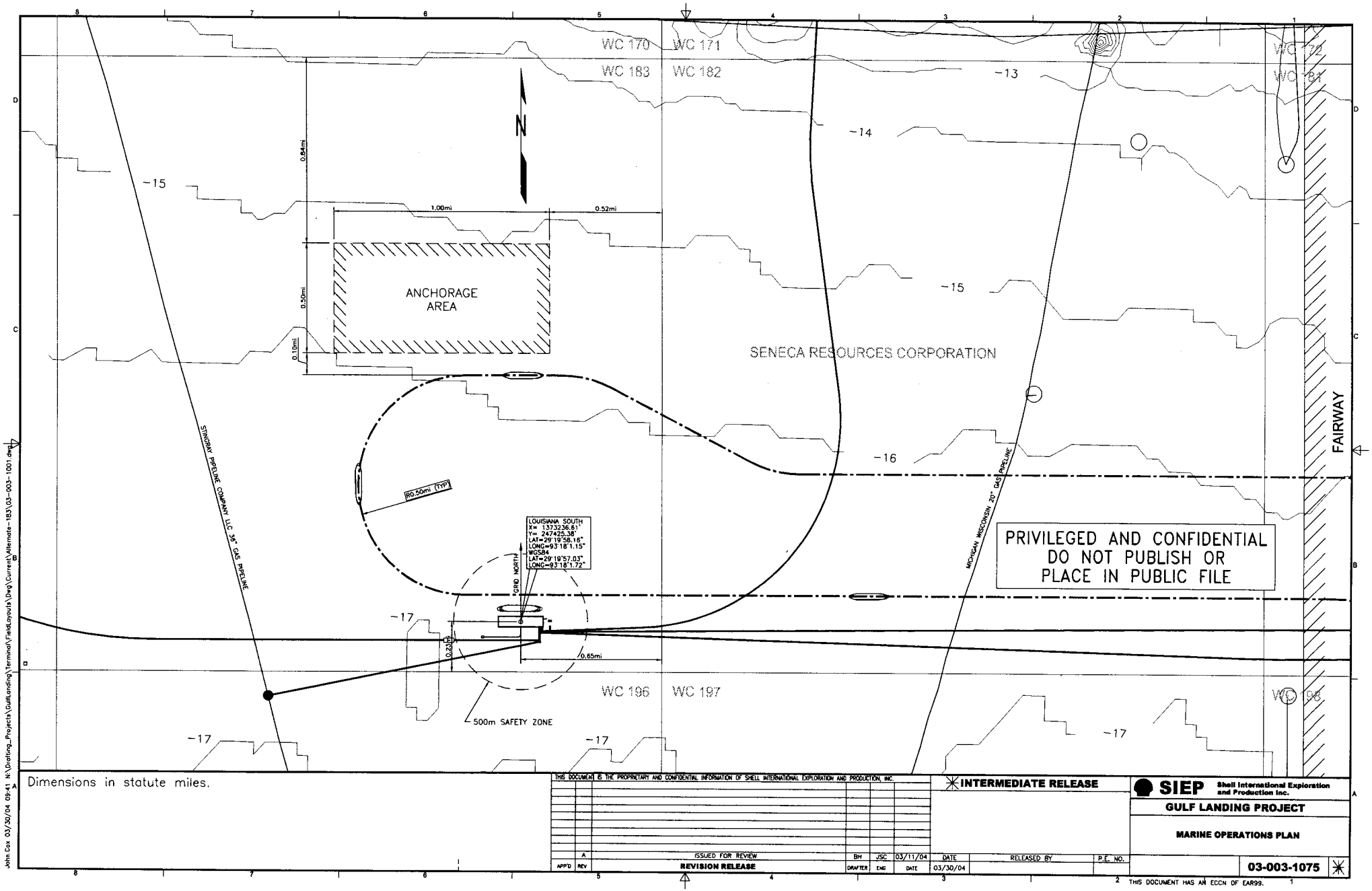


Figure 2
Terminal General Layout



Dimensions in statute miles.

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GULF LANDING PROJECT

MARINE OPERATIONS PLAN

03-003-1075

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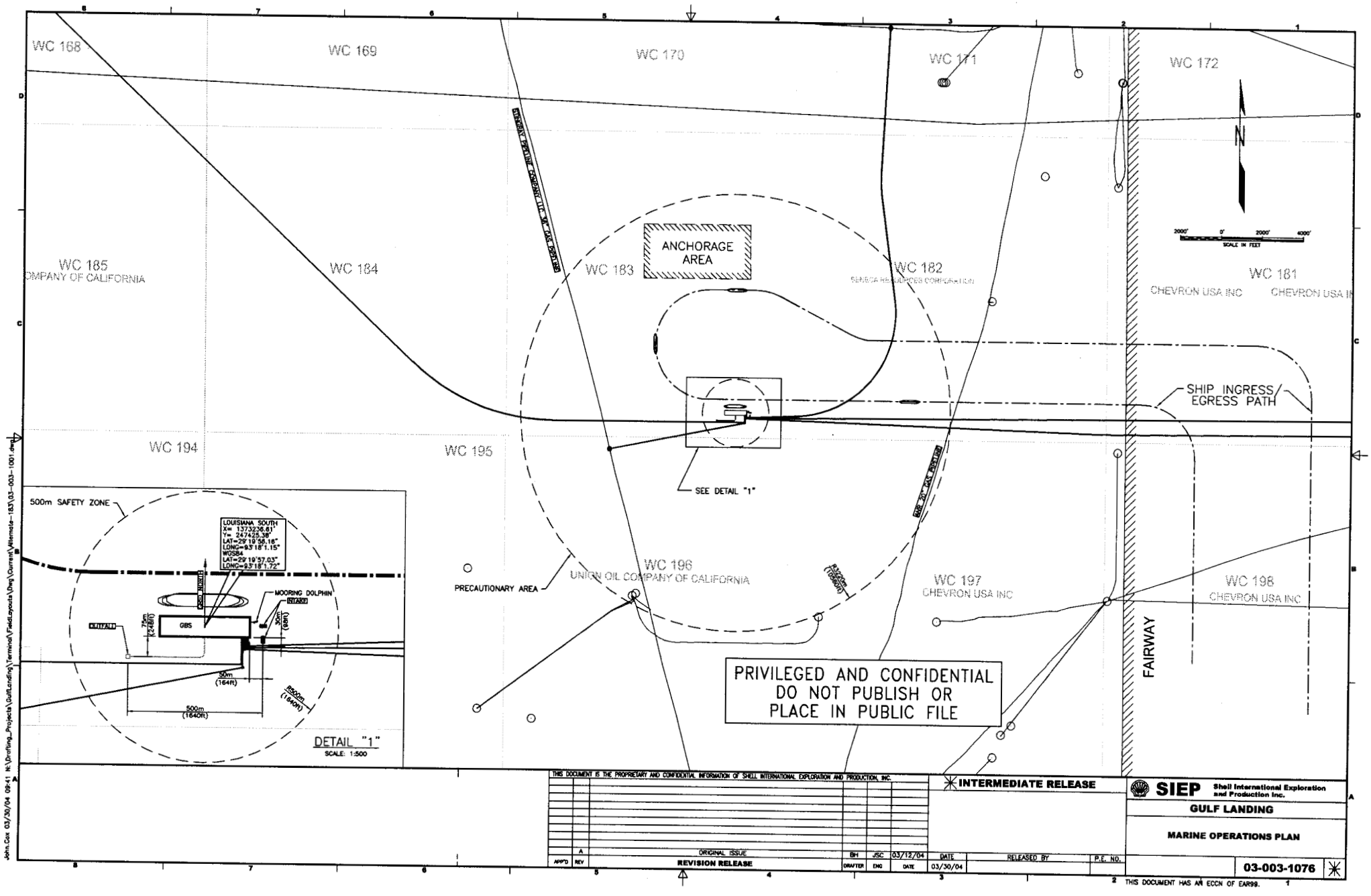

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GULF LANDING

MARINE OPERATIONS PLAN

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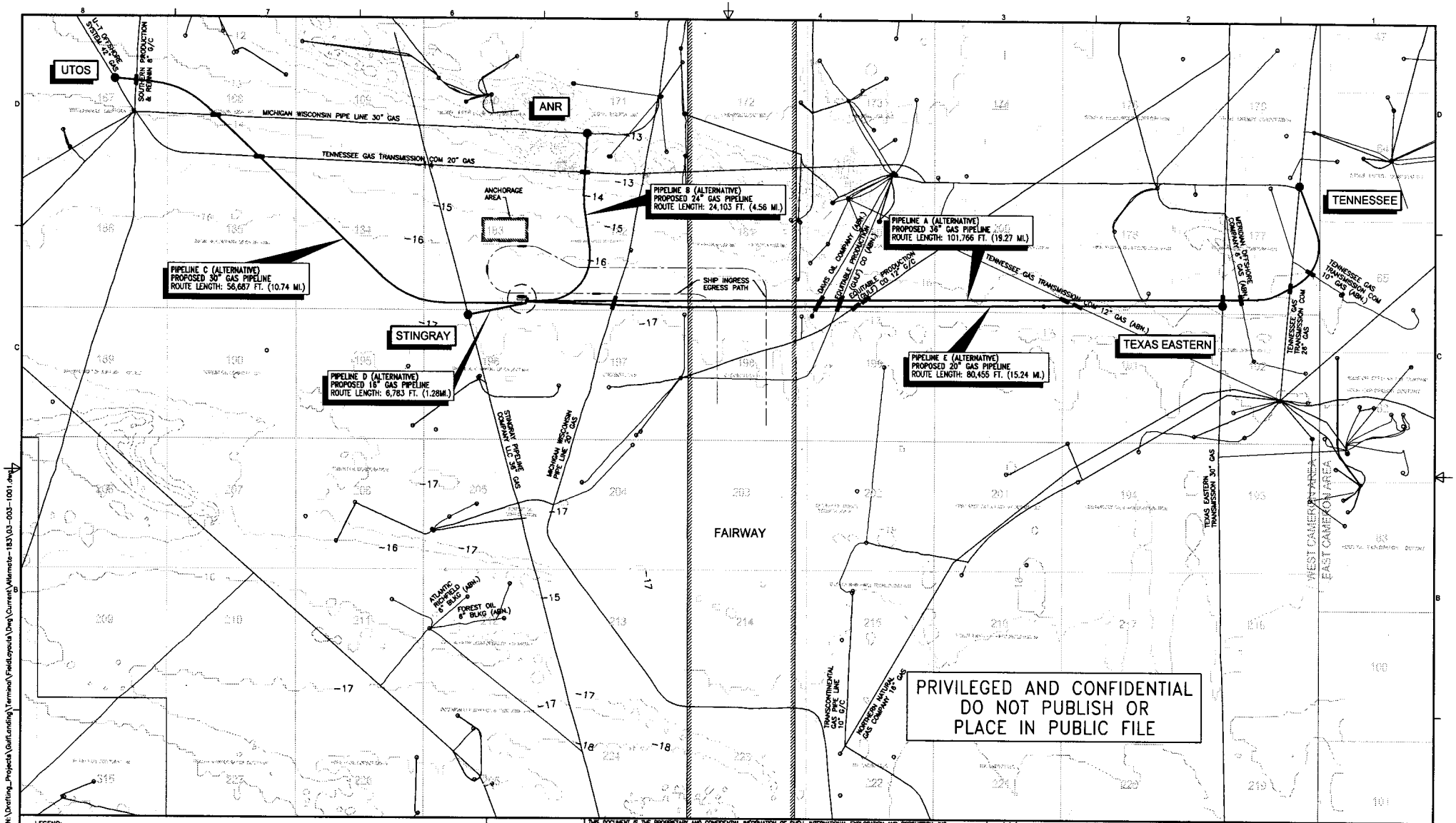

LEGEND:

- SUBSEA TIE-IN
- PIPELINE CROSSING
- EXISTING PIPELINE
- ABANDONED/PROPOSED PIPELINE
- BLOCK REQUIRES 50m SURVEY LINE SPACING
- EXISTING PLATFORM
- REMOVED PLATFORM
- PROPOSED EXPORT PIPELINE

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GAS EXPORT PIPELINES
FAIRWAY AND PIPELINE CROSSING
VICINITY MAP

SCALE: 1"=5000'

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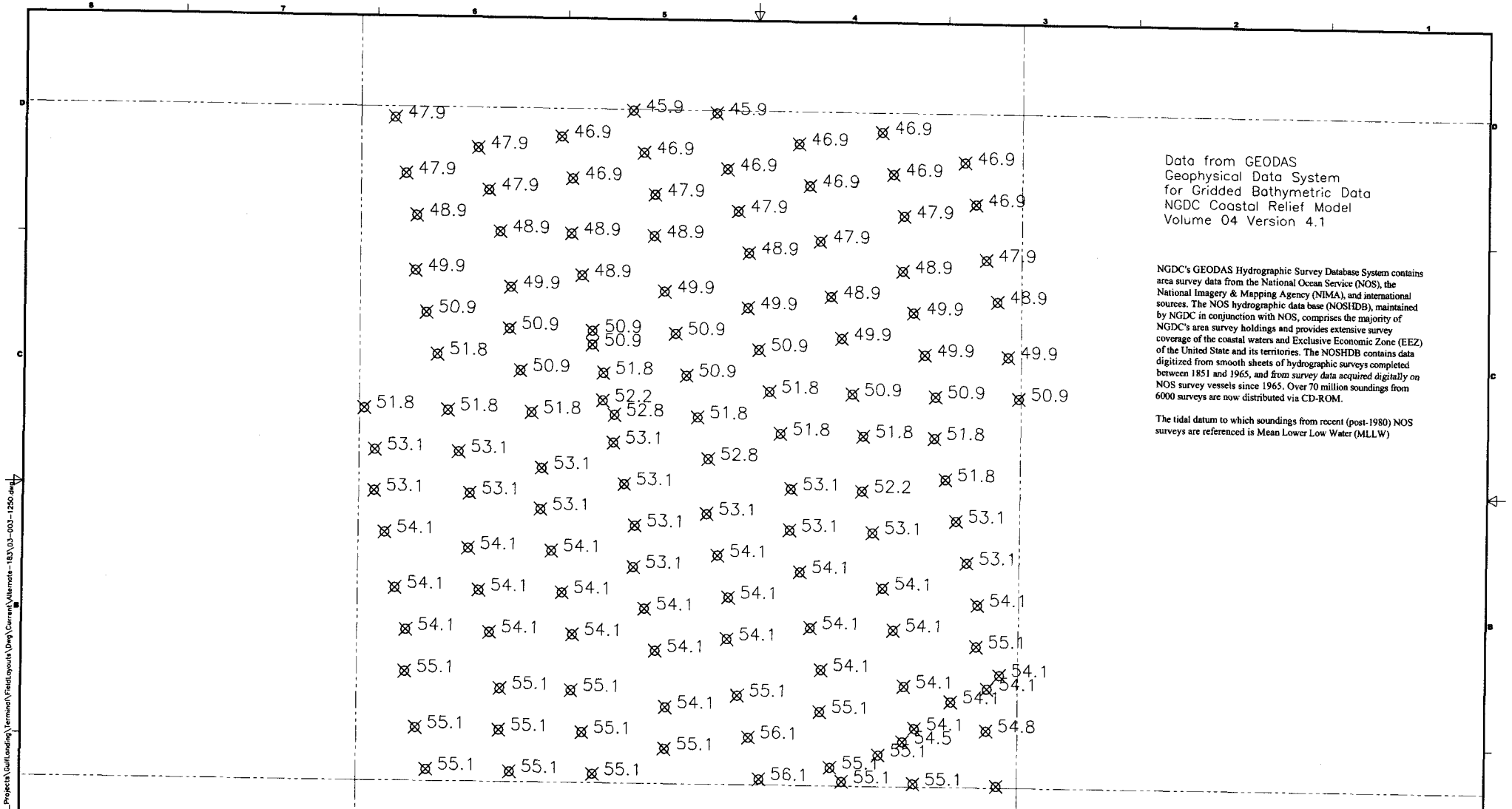

Data from GEODAS
Geophysical Data System
for Gridded Bathymetric Data
NGDC Coastal Relief Model
Volume 04 Version 4.1

NGDC's GEODAS Hydrographic Survey Database System contains area survey data from the National Ocean Service (NOS), the National Imagery & Mapping Agency (NIMA), and international sources. The NOS hydrographic data base (NOSHDB), maintained by NGDC in conjunction with NOS, comprises the majority of NGDC's area survey holdings and provides extensive survey coverage of the coastal waters and Exclusive Economic Zone (EEZ) of the United State and its territories. The NOSHDB contains data digitized from smooth sheets of hydrographic surveys completed between 1851 and 1965, and from survey data acquired *digitally* on NOS survey vessels since 1965. Over 70 million soundings from 6000 surveys are now distributed via CD-ROM.

The tidal datum to which soundings from recent (post-1980) NOS surveys are referenced is Mean Lower Low Water (MLLW)

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GULF LANDING PROJECT

WEST CAMERON BLOCK 183
WATER DEPTHS

03-003-1250

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